Waveform Request

Classic protocol support

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With the availability of increasing possibilities for fast digitizers today, a new listype is designed to support access to waveforms from a Classic protocol client. This note describes how the new support functions.

The current fast digitizers available in IRM systems include the Swift digitizer, providing digitize rates in the 6–800 KHz range, the Quick digitizer, providing rates up to 10 MHz, and the Quicker digitizer, covering the range of 16 KHz – 20 MHz. For all three types of digitizers, the information required to access them by channel number is found in entries of the `CINFO` system table. For each analog channel whose signal is connected to a fast digitizer input, an entry must be placed into this table. In all these cases, the base address of the waveform array of 16-bit readings of the usual fraction of full scale form is included. Given an analog channel number, and a digitizer type, the table is searched to find an entry of that type. The `CINFOEntry` routine serves this purpose.

To support access to a waveform, then, the `CINFO` table is searched for a match on the given channel number, and the waveform base address is obtained. A user can also specify an offset to be added to the base address, so that only a portion of a waveform can be requested. This leads to the following 3-word ident format for the new listype:

```
node
chan
offset
```

The offset is interpreted as an unsigned value, allowing a range of up to 64K bytes. As to providing support for capturing waveform data on a specific clock event, the support for event-specified return is used. This means that on the 15 Hz cycle when the event is detected, the digitizer has collected the waveform by the time the request is being fulfilled. This is suitable for use with the 15 Hz accelerator components. The digitizer is set up to operate at 15 Hz at whatever rate is defined as suitable for its use in general. For the Linac case, the digitizer must be very fast, since the beam pulse is only 40 μs long. For the Booster case, the beam acceleration time is 33 ms, but the IRM does not begin its operation until after the beam has been extracted. In both cases, then, the waveform is available when the IRM begins its usual 15 Hz cyclic activities to update the data pool and fulfill active requests. Clock events of interest occur about 2 ms before the Linac beam pulse, so that their occurrence is known at the start of the IRM cycle. All this means that a request that specifies a clock event at which data should be returned will work. As soon as the event is noticed, the waveform data is already available in the waveform buffer to be sampled in fulfilling a request. This synchronization is very convenient.

The format of the internal pointer is simple. The base address of the waveform, if one exists for the given channel, is augmented by adding the offset value and becomes the internal pointer value. The “read routine” merely accesses the memory as words to fulfill the user request. In the case that no waveform exists, no data need be returned; the buffer can remain as zeros. The “pointer type routine” performs the search to initialize the internal pointer.